WE CLAIM:

1. A method for transmitting an automatic protection switching (APS) message from a first network element (NE) to a second NE of a frame-based optical network, the method comprising:

inserting into a K-byte overhead of a frame sent over a link from the first NE to the second NE, information used to determine a predefined proportion of the link's capacity to which the APS message is related, a tunnel with which the proportion of the link's capacity is associated, and status information related to that tunnel.

2. The method as claimed in claim 1 further comprising:

examining information to be sent in the APS message; and

using a continuity of message indicator in an overhead of the frame to indicate that a balance of the APS message is being sent in K-byte overhead of at least one subsequent frame.

3. The method as claimed in claim 1 wherein inserting the information comprises inserting a tunnel entity ID that identifies both the proportion of the link's capacity, and the tunnel, which provides a local identifier of one of a working tunnel occupying the proportion of the link's capacity, and a protection tunnel reserving the proportion of the link's capacity.

4. The method as claimed in claim 3 wherein inserting the tunnel entity ID comprises inserting an index of a packed lookup table.

5. The method as claimed in claim 3 wherein inserting the status information of the tunnel segment further comprises inserting a preemption priority value that identifies a reason for a protection switch request, the preemption priority value being associated with a hierarchy of the reasons for the protection switch requests.

6. The method as claimed in claim 5 wherein inserting the preemption priority value further comprises inserting an identifier of the preemption priority value associated with both a condition of, and a grade of service of, a tunnel associated with the tunnel member.

7. The method as claimed in claim 6 wherein inserting the status information further comprises indicating:

a state of occupancy of the tunnel segment by the working tunnel associated with the tunnel member, if the tunnel segment is a protection tunnel segment;

whether the tunnel segment is selected, and is therefore transporting traffic of the working tunnel associated with the tunnel member, or the working tunnel member passing through the tunnel segment; and

a signal failure or a signal degrade condition of the tunnel occupying the tunnel segment.

8. A method for transmitting a message on an automatic protection switch channel between a first network element (NE) and a second NE of an optical network, the method comprising:

sending a first K-byte overhead followed by one or more follow-on K-byte overheads in respective sequentially validated frames over a link between the first and second NE, and using at least a continuity of message indicator of the first and follow-on K-byte overheads to indicate a beginning, and an end of the message.

9. The method as claimed in claim 8 wherein using the at least the continuity of message indicator comprises:

setting a continuity of message indicator in the first K-byte overhead to indicate that it is a first of an extended message; and

if the message requires more than one follow-on K-byte overhead, creating a first follow-on K-byte overhead of a corresponding frame, the first follow-on K-byte overhead including a length field for indicating a number of K-byte overheads in the message.

10. The method as claimed in claim 8 further comprising setting the continuity of message indicator in the follow-on K-byte overheads so that each K-byte overhead that is part of the extended message is identifiable as such.

11. The method as claimed in claim 8 further comprising inserting into the first K-byte overhead information that can be used to determine a predefined proportion

of the link's capacity; a tunnel associated with the proportion of the link's capacity; and status information related to that tunnel.

12. The method as claimed in claim 11 further comprising:

determining if the message is for adjacent NE signaling; and

inserting a local message identifier into the K-byte overhead, if the message is limited to adjacent NE signaling.

13. The method as claimed in claim 12 wherein inserting a local message identifier comprises inserting a bit pattern that is not generally used in K-byte overheads of standard frame-based optical networks, to assist in troubleshooting network equipment connection.

14. The method as claimed in claim 8 wherein sending the one or more follow-on K-byte overheads further comprises inserting a command code in the K-byte overhead that identifies how a content field of the K-byte overhead is to be interpreted, and inserting the content into the content field, the content being used for at least one of: controlling transmission of K-byte messages, and managing tunnels provisioned across the link

15. An automatic protection switch (APS) signal processor of a network element (NE) of a mesh-connected, frame-based optical network, the APS signal processor comprising:

a receiver for receiving APS messages in a K-byte overhead of frames transported over a link from an adjacent NE;

an interpreter for reading from the APS messages, information used to determine a predefined proportion of the link's capacity; a tunnel associated with the proportion of the link's capacity; and status information related to that tunnel.

16. The APS signal processor as claimed in claim 15 wherein the interpreter further comprises:

a K-byte interpreter for interpreting K1 and K2 bytes of the frames to read the tunnel segment identifier, status, and the tunnel member; and

an extension interpreter for reading a continuity of message indicator used to indicate at which frame the APS message begins and ends.

17. The APS signal processor as claimed in claim 16 wherein the extension interpreter is further adapted to read the continuity of message indicator that indicates that the APS message is one of the following: self-contained in the one K-byte overhead; contained in the current K-byte overhead in conjunction with that of at least the subsequent frame; a follow-on K-byte overhead; and a resent K-byte message.

18. The APS signal processor as claimed in claim 16 wherein the K-byte interpreter is adapted to read a tunnel entity ID that identifies both the tunnel segment and the use, which identifies a tunnel member

providing a local identifier of one of a working tunnel occupying the proportion of the link's capacity, and a protection tunnel reserving the proportion of the link's capacity.

19. The APS signal processor as claimed in claim 18 wherein the reading the tunnel entity ID comprises reading an index of a packed lookup table.

20. The APS signal processor as claimed in claim 18 wherein the K-byte interpreter reads the status of the tunnel segment to identify a preemption priority value that identifies a reason for a protection switch request, the preemption priority value being associated with a hierarchy of the reasons for protection switch requests.